Nuclear Physics Data Relevant to R-Process Nucleosynthesis

K.-L. Kratz

Institut für Kernchemie, Universität Mainz, Germany

The production of about half of the heavy elements in nature occurs via the r-process, i.e. a combination of rapid neutron captures, the inverse photodisintegrations, and slower β-decays, β-delayed processes as well as fission and possibly interactions with neutrino fluxes. A correct understanding and modelling of this nucleosynthesis process requires the knowledge of nuclear properties far from stability [1,2] and a detailed description of the astrophysical environments. Experiments at radioactive ion beam facilities have played a pioneering role in exploring the characteristics of nuclear structure in terms of masses and β-decay properties. Initial examinations paid attention to short-lived "waiting-point nuclei with magic neutron numbers related to the location and height of the solar-system r-process abundance peaks, while more recent activities, mainly in the ^{132}Sn region, focus on the evolution of shell effects as a function of isospin. In this context, shape transitions and the erosion of the classical shell gaps with possible occurrence of new magic numbers play an important role [3,4].

Consequences of the improved nuclear data input on calculations of the r matter flow up to the A$\sim$260 fission region will be presented for realistic astrophysical scenarios, and the applicability of the long-lived actinides ^{232}Th and ^{238}U as cosmochronometers will be discussed [5,6].

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Email: kl.kratz@uni-mainz.de